

APR 13 1990



April 12, 1990

State of Vermont
Department of Environmental Conservation
Hazardous Materials Division
103 South Main St.
Waterbury, VT 05676
Attn: Bob Haslam

Dear Bob:

Enclosed is a copy of the report on the subsurface investigation at Bob Eaton's, in Manchester. I will call you in a few days to discuss any questions that you may have regarding this report.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter M. Murray".

Peter M. Murray
Project Hydrogeologist

REPORT ON THE INVESTIGATION
OF SUBSURFACE PETROLEUM CONTAMINATION
EATON RESIDENCE
MANCHESTER, VERMONT

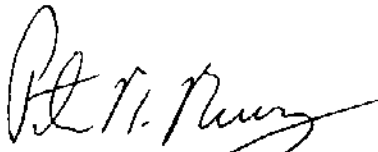
April, 1990

Prepared for:

Nationwide Insurance Company
Williston, Vermont

Prepared by:

Griffin International, Inc.
Jericho, Vermont

A handwritten signature in cursive script, appearing to read "P. M. Murray", is written over a horizontal line.

Peter M. Murray
Project Hydrogeologist

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1.0 INTRODUCTION

This report details the investigation of subsurface petroleum contamination in the vicinity of the Robert and Connie Eaton residence, in Manchester, Vermont. The investigation has been conducted by Griffin International, Inc. for the Nationwide Insurance Company, in Williston, Vermont. Nationwide holds the homeowners insurance policy for the Eaton's. This investigation is part of an insurance claim involving the loss of approximately 130 gallons of heating oil onto the basement floor in the Eaton's house.

2.0 SITE BACKGROUND

2.1 Site Description

The Eaton residence is situated in a small residential area, located approximately one and a half miles south of Manchester Depot. The house sits on a small, elongated hill which rises approximately thirty feet above the Battenkill River, to the west, and a small tributary to the east. All homes in the area have private septic systems and are served by the municipal water system.

According to the Surficial Geologic Map of Vermont, edited by Charles D. Doll, the hill is composed of fluvial gravel, deposited by meltwaters from the receding glacier. The overburden in this area consists of well rounded boulders and cobbles, gravel, sand and silt and is likely greater than eighty feet thick in this vicinity.

2.2 Site History

On January 16th, 1990 Bob Eaton reported to the Vermont DEC that approximately 130 gallons of #2 heating oil had spilled onto his basement floor through a leak in a pipe attached to the bottom of the oil tank. All of the oil had apparently flowed into the sandy dirt floor. Shortly thereafter, approximately twelve yards of contaminated soil were excavated from the basement in an attempt to retrieve most of the lost petroleum. Hydrocarbon vapor concentrations in the excavated soils were measured by a portable photoionization device. Concentrations up to 200ppm were measured in the soils nearest to the original surface of the basement floor. Soils excavated at a depth of six feet contained less than 15ppm hydrocarbon vapors. Excavation was halted at this depth.

To assess the possibility of the remaining contamination migrating to the water table, the Vermont DEC recommended that a subsurface investigation be conducted. Nationwide engaged Griffin International in March, 1990 to conduct the investigation.

3.0 INVESTIGATIVE PROCEDURES

3.1 Monitoring Well Installation

The initial phase of the investigation consisted of the installation of three groundwater monitoring wells for the purpose of identifying local hydrogeologic conditions and the extent of subsurface contamination, if any existed (see Site Map in Appendix for monitoring well locations). The wells were drilled with an air rotary drill rig. Soil samples from each borehole were collected as they were blown out and examined for characteristics and apparent petroleum contamination in the form of noticeable odors or sheens. No apparent petroleum contamination was observed in any of the soils retrieved from the boreholes.

Each well is constructed of two inch diameter, PVC well screen and casing. Each well has twenty feet of screen and twenty feet of casing, (see Well Logs in Appendix for construction details). The annulus between the borehole wall and the well screen was filled with gravel pack to prevent silts from clogging the screen. To prevent infiltration of surface water into the boreholes, a bentonite seal was placed in the annulus near the top of each hole. The wells were completed with eight inch diameter, bolt down manhole covers, clearly marked "monitoring well".

Prior to installation of the wells it was assumed that the water table beneath the house was dipping to the east, toward the small stream. The first well, MW-1, was installed as the upgradient well to the contamination source. This well was drilled to a depth of sixty feet, in an attempt to locate the first impeding layer. At a depth of sixty feet, it was decided to not advance any deeper. Soils retrieved from this hole contained no apparent petroleum contamination. The hole was backfilled with drill cuttings to a depth of forty feet. Screen and well casing were then installed in the borehole. The water table in this well is presently at a depth of approximately thirty three feet.

MW-2 and MW-3 were installed as the two downgradient wells from the source. These wells were both drilled to depths of forty feet. Soils retrieved from these boreholes also contained no apparent petroleum contamination. The soils retrieved from all three boreholes consisted of sand, gravel, cobbles, boulders and a little silt. These types of overburden deposits typically have high permeabilities, which could result in relatively high contamination migration rates through the subsurface.

3.2 Groundwater Gradient and Flow Direction

Upon completion of the wells, water table elevations were measured to determine groundwater gradient and flow direction in the area. The water table elevations in each well are listed on the Groundwater Contour Map in the Appendix. The Map indicates that the water table on the west side of the house is at an elevation of 66.5 feet and the water table on the east side of the house is at an elevation of 70 feet. Normally, the water table would be assumed to be flowing to the west, towards the lower water table elevation. Due to the presence of groundwater contamination on both the east and west sides of the house, however, we are assuming that the water table directly beneath the house is slightly higher than 70 feet. The result is a groundwater flow divide, along which, groundwater flows both east and west. The groundwater flow divide also runs parallel the above topographic divide. The water table gradient is not steep directly beneath the house, although it probably drops off steeply to the east and west of the house.

3.3 Groundwater Sampling and Analysis

On March 17th, water samples were collected from each of the three wells for analysis for Total Petroleum Hydrocarbons using EPA Method 418.1. The laboratory results, located in the Appendix, indicate that both MW-1 and MW-3 contained detectable amounts of petroleum hydrocarbons on that date. MW-2 contained no detectable contamination.

The presence of contamination in both MW-1, which is to the west of the house, and MW-3, which is to the east of the house, suggests that groundwater beneath the house is flowing in both directions. Apparently, some of the contamination has migrated through the

thirty two feet of unsaturated overburden, to the water table. From there, it is spreading in at least two directions, east and west.

There is likely a zone of adsorbed contamination remaining in the unsaturated soils beneath the house. As the adsorbed contamination continues to migrate downward, it will continue to act as a source for dissolved groundwater contamination. Eventually, the soils will be purged of the contamination by natural processes.

4.0 CONCLUSIONS

Based on our findings during this subsurface investigation, we have come to the following conclusions regarding hydrogeologic conditions and the extent of contamination in the vicinity of the Eaton residence:

1. Approximately 130 gallons of #2 heating oil were inadvertently spilled onto the dirt floor of Eaton's basement in January, 1990. Approximately twelve yards of contaminated soil were removed from the basement immediately following the release. It is assumed that a significant portion of the total fuel spilled was removed with this soil.
2. The overburden beneath the Eaton residence consists of well rounded sand, gravel, cobbles and boulders and some silt and probably is greater than eighty feet deep. These deposits presumably have high permeabilities.
3. The groundwater beneath the Eaton's flows both east and west along a groundwater divide. Groundwater flow rates are presumed to be high due to the high permeabilities and steep gradient to the east and west of the house.
4. Analysis of groundwater from the three monitoring wells indicates that at least some of the fuel oil has migrated through the unsaturated soils to the water table. Once the contamination reaches the water table, it flows with the groundwater in at least two, opposite directions.
5. There is likely a significant amount of adsorbed petroleum in the

unsaturated soils beneath Eaton's. This may continue to act as a source of groundwater contamination until it is purged from the soils by natural processes including flushing by surface recharge and biodegradation.

6. Since the homes in the area are all served by municipal water, there is little chance that the groundwater contamination resulting from this spill will enter local drinking water supplies.
7. As the groundwater contamination migrates from the site it likely becomes dispersed and diluted relatively quickly. This should lessen the impact to potential off-site receptors.

5.0 RECOMMENDATIONS

Upon reaching the above conclusions, we would like to present the following recommendation:

1. To monitor the extent of groundwater contamination over time, we recommend regular examination of groundwater from each of the three monitoring wells by visual inspection for obvious petroleum contamination.

APPENDIX

Site Maps, Well Logs, Laboratory Results

SITE MAP

PROJECT : NATIONWIDE INSURANCE CO.
LOCATION : MANCHESTER, VERMONT

● MONITORING WELL



CASS TERRACE



● MW-1

EATON

● MW-2

● MW-3



ENDYNE, INC.

Laboratory Services

32 James Brown Drive
Williston, Vermont 05495
(802) 879-4333
FAX 879-7103

LABORATORY REPORT

TOTAL HYDROCARBONS - EPA METHOD 418.1

CLIENT: Griffin International
REPORT DATE: April 5, 1990
PROJECT NAME: Nationwide/Manchester
DATE SAMPLED: March 17, 1990
DATE RECEIVED: March 17, 1990
DATE ANALYZED: April 4, 1990
SAMPLER: Peter Murray

Reference number:

Concentration (mg/L)¹

10,884	9.2
10,885	<0.8
10,886	6.0
10,887	<0.8

Sample ID:

10,884:	MW-1
10,885:	MW-2
10,886:	MW-3
10,887:	Site Blank

Notes:

1 Method detection limit is 0.8 ppm

Reviewed by Suzanne M. Desdelle

PROJECT NATIONWIDE INSURANCE CO.

LOCATION BOB AND CONNIE EATON, MANCHESTER, VT

DATE DRILLED 3/6/90 TOTAL DEPTH OF HOLE 40'

DIAMETER 6"

SCREEN DIA. 2" LENGTH 20' SLOT SIZE .010"

CASING DIA. 2" LENGTH 20' TYPE PVC

DRILLING CO. FROST DRILLING METHOD AIR ROTARY

DRILLER JODY LOG BY P. MURRAY

WELL NUMBER MW-3

Sketch Map

← N

MW-2 ● ● MW-3

EATON

● MW-1

CASS TERRACE

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0		ROAD BOX		
2		TOP CAP		
4		CONCRETE		
4		BENTONITE		
6				Dry, COBBLES, GRAVEL and SAND
8				
10		NATIVE BACKFILL		
12		WELL CASING		
14				
16				
18				
20				
22				
24		GRAVEL PACK		Fine, moist, light brown SAND
26				
28		WELL SCREEN		
30				
32				WATER TABLE ▼
34				NO PETRO ODOR
36				
38				
40		BOTTOM CAP		Wet, coarse GRAVEL and COBBLES, some sand
42				BASE OF EXPLORATION AT 40'
44				
46				
48				
50				
52				

Griffin International

PROJECT NATIONWIDE INSURANCE CO.LOCATION BOB AND CONNIE EATON, MANCHESTER, VTDATE DRILLED 3/6/90 TOTAL DEPTH OF HOLE 40'DIAMETER 6"SCREEN DIA. 2" LENGTH 20' SLOT SIZE .010"CASING DIA. 2" LENGTH 20' TYPE PVCDRILLING CO. FROST DRILLING METHOD AIR ROTARYDRILLER JODY LOG BY P. MURRAYWELL NUMBER MW-2

Sketch Map

MW-2 ● ● MW-3



EATON

● MW-1

CASS TERRACE

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0		ROAD BOX		
2		TOP CAP		
4		CONCRETE		
4		BENTONITE		
6				Dry, COBBLES, GRAVEL and fine to coarse SAND
8				
10		NATIVE BACKFILL		
12		WELL CASING		
14				
16				
18				
20				
22				
24		GRAVEL PACK		Moist to wet, fine to medium SAND, some gravel
26				NO PETRO ODOR
28		WELL SCREEN		
30				
32				WATER TABLE ▼
34				
36				
38				
40		BOTTOM CAP		BASE OF EXPLORATION AT 40'
42				
44				
46				
48				
50				
52				

Griffin International

PROJECT NATIONWIDE INSURANCE CO.LOCATION BOB AND CONNIE EATON, MANCHESTER, VTDATE DRILLED 3/6/90 TOTAL DEPTH OF HOLE 60'DIAMETER 6"SCREEN DIA. 2" LENGTH 20' SLOT SIZE .010"CASING DIA. 2" LENGTH 20' TYPE PVCDRILLING CO. FROST DRILLING METHOD AIR ROTARYDRILLER JODY LOG BY P. MURRAYWELL NUMBER MW-1

Sketch Map

MW-2 ● MW-3 ●



EATON

■ MW-1

CASS TERRACE

DEPTH IN FEET	WELL CONSTRUCTION	NOTES	BLOWS PER 6" OF SPOON	DESCRIPTION / SOIL CLASSIFICATION (COLOR, TEXTURE, STRUCTURES)
0		ROAD BOX		
2		TOP CAP		
4		CONCRETE		
4		BENTONITE		Dry, COBBLES, GRAVEL and fine to medium SAND
6				
8				
10		NATIVE BACKFILL		
12		WELL CASING		
14				
16				
18				
20				
22				
24		GRAVEL PACK		Moist, fine to medium, light brown SAND, few cobbles
26				
28		WELL SCREEN		
30				
32				
34				
36				
38				
40		BOTTOM CAP		
42				
44				
46		NATIVE BACKFILL		
48				
50				
52				
				WATER TABLE ▼
				Moist to wet, fine, light brown SAND
				BASE OF EXPLORATION AT 60'

Griffin International

GROUNDWATER CONTOUR MAP

PROJECT: NATIONWIDE INSURANCE CO.
LOCATION: MANCHESTER, VERMONT
MONITORING DATE: 3/15/90

● MONITORING WELL

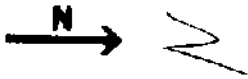
WELL IDENTIFICATION:

MW-1 - WELL I.D.

66.56 - WATER TABLE ELEVATION IN FEET



CASS TERRACE



66.5' 66.5'

● MW-1
66.56

GROUNDWATER
FLOW DIRECTION

GROUNDWATER DIVIDE

EATON

GROUNDWATER
FLOW DIRECTION

67.0' 67.0'

● MW-3
67.03

● MW-2
67.00

Griffin International